IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application : **10/621,003**

Applicant(s) : **BRULS et al.**

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T.C./Art Unit : **2621**

Examiner : **ANYIKIRE, Chikaodili E.**

Atty. Docket : **NL-030905**

Title: **VIDEO DECODER LOCALLY USES MOTION-COMPENSATED INTERPOLATION TO RECONSTRUCT MACRO-BLOCK SKIPPED BY ENCODER**

Mail Stop: **APPEAL BRIEF - PATENTS**
Commissioner for Patents
Alexandria, VA 22313-1450

APPEAL UNDER 37 CFR 41.37

Sir:

This is an appeal from the decision of the Examiner dated 29 August 2008, finally rejecting claims 1-21 of the subject application.

This paper includes (each beginning on a separate sheet):

1. **Appeal Brief;**
2. **Claims Appendix;**
3. **Evidence Appendix; and**
4. **Related Proceedings Appendix.**

APPEAL BRIEF

I. REAL PARTY IN INTEREST

The above-identified application is assigned, in its entirety, to **Koninklijke Philips Electronics N. V.**

II. RELATED APPEALS AND INTERFERENCES

Appellant is not aware of any co-pending appeal or interference that will directly affect, or be directly affected by, or have any bearing on, the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-21 are pending in the application.

Claims 17-19 stand rejected by the Examiner under 35 U.S.C. 101.

Claims 1-21 stand rejected by the Examiner under 35 U.S.C. 102(e).

These rejected claims are the subject of this appeal.

IV. STATUS OF AMENDMENTS

No amendments were filed subsequent to the final rejection in the Office Action dated 29 August 2008. A reply was filed on 28 October 2008.

V. SUMMARY OF CLAIMED SUBJECT MATTER[1]

This invention addresses the processing of video data for efficient transmission (Applicants' page 1, lines 7-8). Motion-compensated predictive coding, such as MPEG encoding, compares blocks of an image, and encodes the differences (page 1, line 25 - page 2, line 6). Motion-compensated interpolation, such as used for converting film-generated video material into higher frame-rate video material, generates intermediate frames between two consecutive frames by an interpolation of the frames (page 3, lines 2-5); there is no encoding of differences, per se, because the intermediate frames had not previously existed, and there is no difference to report (page 2, lines 7-8). In an example embodiment (FIGs. 5 and 6), conventional coding efficiency is improved by determining whether segments of an existing frame could have been generated by interpolation of other frames, typically prior and subsequent frames (506); if so, the segment is not encoded (508). If interpolation is not sufficient to generate the intermediate segment, the segment is encoded in the conventional manner (510) (page 10, lines 25-31). At the decoder (FIG. 6), if the block is discovered to be missing (604), it is reconstructed by interpolation of the other (e.g. prior and subsequent) frames (606) (page 10, lines 32-34). In an example embodiment, "natural-motion" (NM) interpolation is used, and the segments that are assessed to determine whether they can be reconstructed by interpolation are macroblocks of "B" frames in an MPEG-2 encoding (page 3, lines 10-16).

[1] It is respectfully noted that it is not the appellants' intention that the claimed embodiments of this invention be limited to operation within the example embodiments described in this brief, beyond what is required by the claim language. These examples and their description are provided to facilitate ease of understanding and to comply with the requirements of an appeal brief, without intending that any further interpreted limitations be read into the claims as presented.

As claimed in independent claim 1, an embodiment of the invention comprises a method of encoding a video picture, the method comprising (FIG. 5):

for a segment of the video picture, determining if the segment can be reconstructed from at least an other video picture based on motion-compensated interpolation applied to the other video picture (504-506) (page 10, lines 25-29);

if (506) the segment cannot be reconstructed, encoding the segment (510); and otherwise, skipping the segment (508) (page 10, lines 29-31).

As claimed in dependent claim 4, an embodiment of the invention comprises the method of claim 3, wherein the coding scheme complies with MPEG-2 and wherein the determining comprises (FIGs. 2 and 3):

decoding an encoded B-picture (206);

generating a further picture using motion-compensated interpolation applied to the other video picture (220) (page 9, lines 24-27);

determining a difference per macroblock between the decoded B-picture and the further picture (222, 302) (page 9, lines 27-28); and

evaluating the difference under control of a consistency measure of motion vectors associated with the further picture (304) (page 9, lines 28-29).

As claimed in dependent claim 20, an embodiment of the invention comprises the method of claim 3, wherein the coding scheme complies with MPEG-2 and wherein the determining comprises (FIGs. 2 and 3):

generating a further picture using motion-compensated interpolation applied to the other video picture (220) (page 9, lines 24-27);

determining a difference per macroblock between the further picture and the video picture (222, 302) (page 9, lines 27-28); and

evaluating the difference under control of a consistency measure of motion vectors associated with the further picture (304) (page 9, lines 28-29).

As claimed in independent claim 5, an embodiment of the invention comprises an electronic device (FIG. 2) comprising an encoder (218) for encoding a video picture, wherein the encoder (218) is configured to determine (222) for a segment of the picture if the segment can be reconstructed from at least another video picture based on motion-compensated interpolation applied to the other video picture (page 9, lines 24-29); and wherein the encoder (218) encodes the segment if the segment cannot be reconstructed, and skips the segment otherwise (224, 226) (page 9, lines 29-34).

As claimed in dependent claim 8, an embodiment of the invention comprises the device of claim 7, wherein the coding scheme complies with MPEG-2 and wherein the encoder comprises (FIGs. 2 and 3):

a decoder (206) for decoding an encoded B-picture (page 9, lines 15-16, 24-28);

a generator (220) for generating a further picture using motion-compensated interpolation applied to the other video picture (page 9, lines 24-27);

a comparator (222, 302) for determining a difference per macroblock between the decoded B-picture and the further picture (page 9, lines 29-31); and

an evaluator (304) for evaluating the difference under control of a consistency measure of motion vectors associated with the further picture (page 9, lines 28-29; page 7, lines 14-18).

As claimed in dependent claim 21, an embodiment of the invention comprises the device of claim 7, wherein the coding scheme complies with MPEG-2 and wherein the encoder comprises (FIGs. 2 and 3):

a generator (220) for generating a further picture using motion-compensated interpolation applied to the other video picture (page 9, lines 24-27);

a comparator (222, 302) for determining a difference per macroblock between the further picture and the video picture (page 9, lines 27-28); and

an evaluator (304) for evaluating the difference under control of a consistency measure of motion vectors associated with the further picture (page 9, lines 28-29; page 7, lines 14-18).

As claimed in independent claim 9, an embodiment of the invention comprises a method of decoding an encoded video picture comprising (FIG. 6):

determining if a segment of the picture is missing (604) (page 10, line 33); and

if the segment is missing, reconstructing the segment from motion-compensated interpolation applied to at least another video picture (606) (page 10, lines 32-34).

As claimed in dependent claim 12, an embodiment of the invention comprises a method of claim 10, wherein:

decoding the picture comprises using an MPEG-2 skipped-macroblock condition (page 10, lines 17-18); and

writing data, generated by the motion-compensated interpolation to reconstruct the macroblock, over further data generated under the skipped-macroblock condition (page 10, lines 18-24).

As claimed in independent claim 13, an embodiment of the invention comprises an electronic device (FIG. 4) comprising a decoder (400) for decoding an encoded video picture (page 10, lines 14-15), the decoder being operative to reconstruct a missing segment of the video picture (404) (page 10, lines 17-19) based on motion-compensated interpolation (406) applied to at least another video picture (402) (page 10, lines 19-24).

As claimed in dependent claim 14, an embodiment of the invention comprises the device of claim 14, configured to decode the picture using a skipped-macroblock condition (page 10, lines 17-18); and operative to write data, generated by the motion-compensated interpolation to reconstruct the macroblock (page 10, lines 18-22), over further data generated under the skipped-macroblock condition (page 10, lines 23-24).

As claimed in independent claim 17, an embodiment of the invention comprises a computer readable medium that includes control software (page 11, lines 10-16) for installing on an electronic device for decoding a video picture from which a segment is missing (page 4, lines 32-33), the software being configured to reconstruct the segment based on motion compensated interpolation applied to at least another video picture (page 4, line 33 - page 5, line 2).

As claimed in independent claim 18, an embodiment of the invention comprises a computer readable medium that includes control software (page 11, lines 10-16) for installing on an electronic device for encoding a video picture (page 5, lines 3-4), the software being configured to determine for a segment of the picture if the segment can be reconstructed from at least another video picture based on motion-compensated interpolation applied to the other video picture (page 5, lines 4-6); and to control the encoding so as to have the segment encoded if the segment cannot be reconstructed, and to have the segment skipped otherwise (page 5, lines 6-8).

As claimed in independent claim 19, an embodiment of the invention comprises a computer readable medium that includes electronic video content information (page 5, line 9) encoded such that at decoding at least one segment of at least one picture is to be reconstructed using motion-compensated interpolation performed on at least one other picture (page 5, lines 10-12).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 17-19 stand rejected under 35 U.S.C. 101.

Claims 1-21 stand rejected under 35 U.S.C. 102(e) over Hosono (USP 5,796,438).

VII. ARGUMENT

Claims 17-19 stand rejected under 35 U.S.C. 101

Claims 17-18

The Office action acknowledges that claims 17-18 claim control software embodying functionally descriptive material, but asserts that "the claim does not define a computer-readable medium or memory and is thus non-statutory for that reason" (Office action, page 4, lines 14-16). This assertion is incorrect.

Claims 17 and 18 specifically recite: "Computer readable medium that includes control software..."

Because the Examiner's asserted reason for rejecting claims 17 and 18 is clearly erroneous, the applicants respectfully maintain that the rejection of claims 17-18 under 35 U.S.C. 101 is unfounded, and should be reversed by the Board.

Claim 19

The Office action acknowledges that the applicants' claimed electronic video content information embodies functionally descriptive material, and notes that such material may be claimed as a statutory product when embodied on a tangible computer readable medium, but asserts that claim 19 defines a "signal" (Office action, page 4, line 27 – page 7, line 6). This assertion is also incorrect.

Claim 19 specifically recites: "Computer readable medium that includes electronic video content information…"

MPEP 2106 notes the fact that a signal is a computer-readable medium, but does not summarily conclude that this fact renders all computer-readable medium non-statutory subject matter. The applicants do not claim a signal, per se, as asserted in the Office action.

Because the Examiner's asserted reason for rejecting claim 19 is clearly erroneous, the applicants respectfully maintain that the rejection of claim 19 under 35 U.S.C. 101 is unfounded, and should be reversed by the Board.

Claims 1-21 stand rejected under 35 U.S.C. 102(e) over Hosono

MPEP 2131 states:

> "A claim is anticipated only if ***each and every element*** as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The ***identical invention*** must be shown in as ***complete detail*** as is contained in the ... claim." *Richardson v. Suzuki Motor Co*., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claims 1-8 and 18-21

As claimed in claim 1, upon which claims 2-4 and 20 depend, an embodiment of the invention includes determining if a segment of a video picture can be reconstructed from at least another video picture based on motion-compensated interpolation applied to the other video picture; and, if the segment cannot be reconstructed, encoding the segment, otherwise skipping the segment. Independent claim 5, upon which claims 6-8 and 21 depend, and independent claims 18 and 19 include similar features, and the Office action provides a common basis for rejecting claims 1, 5, 18, and 19.

Hosono fails to teach determining if a segment of a video picture can be reconstructed based on motion-compensated interpolation, and Hosono fails to teach skipping the segment if it can be reconstructed by motion-compensated interpolation.

The Office action asserts that Hosono provides this teaching at FIG. 9 and column 8, lines 30-40. The applicants respectfully disagree with this assertion. At the cited text, Hosono teaches:

> "As for the P-picture, basically a difference from the temporally previous I-picture or P-picture is encoded and transmitted. As for the B-picture, basically a difference from mean values of a temporally previous frame and/or a temporally succeeding frame is found and the difference is encoded and transmitted.
> If the difference (encoded difference) is to be transmitted, as in the case of the P- or B-picture, a motion vector with respect to the picture of the frame the difference from which is calculated, that is a prediction picture, is transmitted along with the difference data. The motion vector is the frame-to-frame motion vector for forward prediction and/or frame-to-frame motion vector for backward prediction." (Hosono, column 8, lines 28-40.)

As is clearly evident, the cited text does not address interpolation. The cited text addresses the convention encoding of the differences between frames. The cited text does not teach determining whether a picture can be reconstructed based on interpolation, and does not teach skipping the encoding if it can be reconstructed based on interpolation. In MPEP, frames are encoded and decoded based on the differences between blocks; they are not encoded or decoded based on whether they can be interpolated from other blocks.

Because Hosono fails to teach determining if a segment of a video picture can be reconstructed based on motion-compensated interpolation, and fails to teach skipping encoding of the segment if it can be reconstructed, and because the Office action fails to identify where Hosono teaches interpolation and decisions based on interpolation, the applicants respectfully maintain that the rejection of claims 1-8 and 18-21 under 35 U.S.C. 102(e) over Hosono is unfounded, per MPEP 2131, and should be reversed by the Board.

Claims 4, 8, 20, 21

As claimed in dependent claim 4, an embodiment of the invention includes determining if a segment can be reconstructed includes generating a further picture using motion-compensated interpolation applied to the other video picture and determining a difference per macroblock between a decoded B-picture and the further picture. Dependent claims 8, 20, and 21 include similar limitations, and the Office action provides a common basis for rejecting claims 4, 8, 20, and 21.

Hosono does not teach generating a picture using interpolation of other video pictures, and does not teach determining a difference between a decoded B-picture and the generated picture, as claimed by the applicants.

The Office action asserts that Hosono teaches generating a picture using interpolation at column 8, lines 30-40. The applicants respectfully disagree with this assertion. It is readily apparent that the cited text, provided above, does not teach generating a picture. The cited text addresses encoding an image based on differences from prior images; the generation of a picture is not addressed in the cited text, as asserted in the Office action.

Because Hosono fails to teach generating a picture using interpolation of other video pictures, and does not teach determining a difference between a decoded B-picture and the generated picture, and because the Office action fails to identify where Hosono teaches the generation of pictures based on interpolation, the applicants respectfully maintain that the rejection of claims 4, 8, 20, and 21 under 35 U.S.C. 102(e) over Hosono is unfounded, per MPEP 2131, and should be reversed by the Board.

Claims 9-17

As claimed in independent claim 9, upon which claims 10-12 depend, an embodiment of the invention includes a method of decoding an encoded video picture that includes reconstructing a segment from motion-compensated interpolation applied to at least another video picture if the segment is missing from an encoding. Independent claim 13, upon which claims 14-16 depend, and independent claim 17 include similar features, and the Office action provides a common basis for rejecting claims 9, 13, and 17.

Hosono does not teach reconstructing a segment from motion-compensated interpolation applied to at least another video picture if the segment is missing from an encoding, as claimed in each of claims 9, 13, and 17.

The Office action asserts that Hosono teaches reconstructing a segment using interpolation at column 8, lines 30-40. The applicants respectfully disagree with this assertion. The applicants note that, in addition to the cited text (provided above) not teaching interpolation, the cited text expressly deals with the encoding of video frames; it does not address operations for decoding an encoded video picture as claimed in claims 9-17.

Because Hosono fails to teach reconstructing a segment from motion-compensated interpolation applied to at least another video picture if the segment is missing from an encoding, and because the Office action fails to identify where Hosono teaches generating decoded pictures based on interpolation, the applicants respectfully maintain that the rejection of claims 8-17 under 35 U.S.C. 102(e) over Hosono is unfounded, per MPEP 2131, and should be reversed by the Board.

Claims 12 and 16

As claimed in dependent claim 12, an embodiment of the invention includes using an MPEG-2 skipped-macroblock condition to decode the picture, and writing data generated by the motion-compensated interpolation to reconstruct a macroblock over further data generated under the skipped-macroblock condition. Claim 16 includes similar limitations and the Office action provides a common basis for rejecting claims 12 and 16.

Hosono does not teach writing data generated by motion-compensated interpolation to reconstruct a macroblock over further data generated under a skipped-macroblock condition.

The Office action asserts that Hosono teaches writing data generated by motion-compensated interpolation to reconstruct a macroblock over further data generated under a skipped-macroblock condition at column 8, lines 30-40. The applicants respectfully disagree with this assertion. The applicants note that, in addition to the cited text (provided above) not teaching interpolation, the cited text expressly deals with the encoding of video frames; it does not address operations for decoding an encoded video picture as claimed in claims 12 and 16.

Because Hosono fails to teach writing data generated by motion-compensated interpolation to reconstruct a macroblock over further data generated under a skipped-macroblock condition, and because the Office action fails to identify where Hosono teaches generating data based on interpolation, the applicants respectfully maintain that the rejection of claims 12 and 16 under 35 U.S.C. 102(e) over Hosono is unfounded, per MPEP 2131, and should be reversed by the Board.

CONCLUSIONS

Because the Office action's assertions in support of the rejection of claims 17-19 under 35 U.S.C. 101 are incorrect, the applicants respectfully request that the rejection of claims 17-19 under 35 U.S.C. 101 be reversed by the Board, and the claims be allowed to pass to issue.

Because Hosono fails to teach determining if a segment of a video picture can be reconstructed based on motion-compensated interpolation, and Hosono fails to teach skipping the segment if it can be reconstructed, the applicants respectfully request that the Examiner's rejection of claims 1-8 and 18-21 under 35 U.S.C. 102(e) over Hosono be reversed by the Board, and the claims be allowed to pass to issue.

Because Hosono fails to teach reconstructing a missing segment from motion-compensated interpolation applied to at least another video picture, the applicants respectfully request that the Examiner's rejection of claims 9-17 under 35 U.S.C. 102(e) over Hosono be reversed by the Board, and the claims be allowed to pass to issue.

Because the Office action's assertions in support of the rejection of dependent claims 4, 8, 12, 16, 20, and 21 are inconsistent with Hosono's teachings, the applicants respectfully request that the rejection of claims 4, 8, 12, 16, 20, and 21 under 35 U.S.C. 102(e) over Hosono be reversed by the Board, and the claims be allowed to pass to issue.

Respectfully submitted

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CLAIMS APPENDIX

1. A method of encoding a video picture, the method comprising:

- for a segment of the video picture determining if the segment can be reconstructed from at least another video picture based on motion-compensated interpolation applied to the other video picture;
- if the segment cannot be reconstructed, encoding the segment; and
- otherwise skipping the segment.

2. The method of claim 1, wherein the segment comprises a macroblock.

3. The method of claim 1, wherein the encoding comprises using a coding scheme compliant with one of ISO and ITU video compression standards.

4. The method of claim 3, wherein the coding scheme complies with MPEG-2 and wherein the determining comprises:

- decoding an encoded B-picture;
- generating a further picture using motion-compensated interpolation applied to the other video picture;
- determining a difference per macroblock between the decoded B-picture and the further picture; and
- evaluating the difference under control of a consistency measure of motion vectors associated with the further picture.

5. An electronic device comprising an encoder for encoding a video picture, wherein the encoder is configured to determine for a segment of the picture if the segment can be reconstructed from at least another video picture based on motion-compensated interpolation applied to the other video picture; and wherein the encoder encodes the segment if the segment cannot be reconstructed, and skips the segment otherwise.

6. The device of claim 5, wherein the segment comprises a macroblock.

7. The device of claim 5, wherein the encoder is configured to use a coding scheme compliant with one of ISO and ITU video compression standards.

8. The device of claim 7, wherein the coding scheme complies with MPEG-2 and wherein the encoder comprises:

- a decoder for decoding an encoded B-picture;
- a generator for generating a further picture using motion-compensated interpolation applied to the other video picture;
- a comparator for determining a difference per macroblock between the decoded B-picture and the further picture; and
- an evaluator for evaluating the difference under control of a consistency measure of motion vectors associated with the further picture.

9. A method of decoding an encoded video picture, the method comprising:

- determining if a segment of the picture is missing; and
- if the segment is missing, reconstructing the segment from motion-compensated interpolation applied to at least another video picture.

10. The method of claim 9, wherein the segment comprises a macroblock.

11. The method of claim 9, wherein the video picture is encoded using a coding scheme compliant with one of ISO and ITU video compression standards.

12. The method of claim 10, wherein:

- decoding the picture comprises using an MPEG-2 skipped-macroblock condition; and
- writing data, generated by the motion-compensated interpolation to reconstruct the macroblock, over further data generated under the skipped-macroblock condition.

13. An electronic device comprising a decoder for decoding an encoded video picture, the decoder being operative to reconstruct a missing segment of the video picture based on motion-compensated interpolation applied to at least another video picture.

14. The device of claim 13, wherein the missing segment comprises a macroblock.

15. The device of claim 13, configured to decode the picture encoded using a coding scheme compliant with one of ISO and ITU video compression standards.

16. The device of claim 14, configured to decode the picture using a skipped-macroblock condition; and operative to write data, generated by the motion-compensated interpolation to reconstruct the macroblock, over further data generated under the skipped-macroblock condition.

17. Computer readable medium that includes control software for installing on an electronic device for decoding a video picture from which a segment is missing, the software being configured to reconstruct the segment based on motion compensated interpolation applied to at least another video picture.

18. Computer readable medium that includes control software for installing on an electronic device for encoding a video picture, the software being configured to determine for a segment of the picture if the segment can be reconstructed from at least another video picture based on motion-compensated interpolation applied to the other video picture; and to control the encoding so as to have the segment encoded if the segment cannot be reconstructed, and to have the segment skipped otherwise.

19. Computer readable medium that includes electronic video content information encoded such that at decoding at least one segment of at least one picture is to be reconstructed using motion-compensated interpolation performed on at least one other picture.

20. The method of claim 3, wherein the coding scheme complies with MPEG-2 and wherein the determining comprises:

- generating a further picture using motion-compensated interpolation applied to the other video picture;
- determining a difference per macroblock between the further picture and the video picture; and
- evaluating the difference under control of a consistency measure of motion vectors associated with the further picture.

21. The device of claim 7, wherein the coding scheme complies with MPEG-2 and wherein the encoder comprises:

- a generator for generating a further picture using motion-compensated interpolation applied to the other video picture;
- a comparator for determining a difference per macroblock between the further picture and the video picture; and
- an evaluator for evaluating the difference under control of a consistency measure of motion vectors associated with the further picture.

EVIDENCE APPENDIX

No evidence has been submitted that is relied upon by the appellant in this appeal.

RELATED PROCEEDINGS APPENDIX

Appellant is not aware of any co-pending appeal or interference which will directly affect or be directly affected by or have any bearing on the Board's decision in the pending appeal.